

CLAIMS

What is claimed is:

1. A stabilized  $\text{AlPO}_4$  composition comprising  $\text{CaO}$ ,  $\text{SiO}_2$  and  $\text{AlPO}_4$  at a ratio of greater than 0 to less than about 4 mole percent  $\text{CaO}$ , greater than 0 to less than about 10 mole percent  $\text{SiO}_2$ , and greater than about 86 to less than about 100 mole percent  $\text{AlPO}_4$ .

2. The composition of Claim 1 comprising  $\text{CaO}$ ,  $\text{SiO}_2$  and  $\text{AlPO}_4$  at a mole percent ratio of greater than 0 to less than about 3  $\text{CaO}$ , greater than 0 to less than about 6  $\text{SiO}_2$ , and greater than about 91 to less than about 100  $\text{AlPO}_4$ .

3. The composition of Claim 1 comprising  $\text{CaO}$ ,  $\text{SiO}_2$  and  $\text{AlPO}_4$  at a mole percent ratio of about 2.3  $\text{CaO}$ , about 5.7  $\text{SiO}_2$ , and about 92  $\text{AlPO}_4$ .

4. A stabilized  $\text{AlPO}_4$  composition comprising  $\text{XO}$ ,  $\text{SiO}_2$  and  $\text{AlPO}_4$  at a ratio of greater than 0 to less than about 4 mole percent  $\text{XO}$ , greater than 0 to less than about 10 mole percent  $\text{SiO}_2$ , and greater than about 86 to less than about 100 mole percent  $\text{AlPO}_4$ , wherein  $\text{X}$  is any cation with an atomic radius of about 1 angstrom.

5. The composition of Claim 4 wherein  $\text{X}$  is selected from the group consisting of potassium and copper.

6. The composition of Claim 4 or 5 wherein the mole percent ratio is about 2.3  $\text{XO}$ , about 5.7  $\text{SiO}_2$ , and about 92  $\text{AlPO}_4$ .

7. A method for stabilizing  $\text{AlPO}_4$  ceramic microstructures comprising the steps of:

a) admixing an acidic solution of  $\text{AlPO}_4$  to solutions of  $\text{SiO}_2$  and a calcium oxide source wherein the mole percent ratios are greater than about 86 to less than about 100  $\text{AlPO}_4$ , greater than 0 to less than about 10  $\text{SiO}_2$ , and greater than 0 to less than about 4 calcium;

b) raising the pH of the admixture to form a slurry; and

c) removing water to form the precipitate.

5 8. The method of Claim 7 wherein the acidity of the acidic solutions of step (a) is about 2.5.

9. The method of Claim 7 wherein the pH in step (b) is raised to about 9.

10 10. The method of Claim 7, 8 or 9 wherein the mole percent ratios are 0 to about 3 Ca, 0 to about 6 Si, and about 91 to about 100 Al.

11. The method of Claim 7, 8 or 9 wherein the mole percent ratios are about 2.3 Ca, about 5.7 Si, and about 92 Al.

15 12. An  $\text{AlPO}_4$  composition that has a cubic structure, space group F-43m, with a  $\sim 7.2$  Angstroms at a temperature of less than about  $270^\circ\text{C}$ .

13. A composition according to Claim 12 that is single phase.

20 14. A composition according to Claim 12 comprising a silica dopant and a dopant having a cation with an atomic radius of about 1 angstrom.

15. A composition according to Claim 14 wherein the dopant having a cation with an atomic radius of about 1 angstrom comprises  $\text{CaO}$ .

25 16. A composition according to Claim 12 wherein the cubic structure is maintained up to at least  $1000^\circ\text{C}$ .

17. A composition according to Claim 12 which is at a temperature in the range of from room temperature to about  $250^\circ\text{C}$ .

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